circle intersecting the inner blade edges and a line tangent to the blade centerline at its leading edge.

REMARKS

All 35 U.S.C. 112 objections are attended to above.

Reconsideration is respectfully requested with regard to the rejection of claims 1 through 10 on Budelman '331 in view of Nelson '696. Heat sinks of the general type disclosed in Budelman have been used for some time in computers and other electronic devices. In all such devices known to the applicant, axial fans or forwardly curved impellers have been employed. At the present time, however, with the ever increasing complexity of the electronics and the resulting requirements for heat dissipation at a much higher and more efficient rate, a new approach is needed. The rearwardly curved impeller provides the answer and, it is submitted, a wholly unobvious answer. Rearwardly curved impellers operate on entirely different physics principles than forwardly curved impellers and never have a heat sink disposed in their inlets. A rearwardly curved impeller is not merely a fix for reduced sound generation as the Examiner implies although the sound generation characteristics of the unit are greatly improved with the incorporation of rearwardly curved blades.

The Applicant is fully informed with regard to the Budelman design. Torrington Research Company was engaged by Intel to improve the performance of the Budelman heat sink and the Applicant was intimately involved in this effort.

Initially a most surprising and unexpected result was achieved when the direction of rotation of the Budelman forwardly curved impeller was rotated in the reverse direction. A 100% improvement in overall performance was obtained.

Surely such a striking improvement was not the result of a merely routine or obvious substition of elements. Prior teaching was away from rather than toward the solution provided by the present invention.

It is believed that this performance improvement derives from the interaction of the rearwardly curved blades with discrete small air streams flowing respectively from the multiplicity of small air flow passages between the heat dissipating elements.

In prior applications air entering rearwardly curved impeller blades had a tendency to swirl and become turbulent. In the present instance however, and with the passage of the air through the pin arrangement prior to entering the impeller, relatively laminar and uniform flow is provided and this greatly enhances impeller performance.

The performance has now been further improved with specific characteristics of the Applicant's impeller clearly not involving merely a "routine skill in the art". Absent anticipation in the prior art, which the Examiner has failed to provide, it is submitted that much more than "routine skill" is required in quadrupling performance. This is the final result obtained with Applicant's impeller.

Claim 11 recites the radially spaced arrangement of inlet opening and blade leading edges and the provision of 20-26 blades. Conventional rearwardly curved impellers employ approximately one half this number of blades (see Nelson Fig. 3a).

Claim 4, now including the W to R limitation together with the 20 to 26 blade number limitation, recites a particularly advantageous combination of features. The relatively narrow blade annulus (W) accommodates an increase in the number of blades and the enhanced performance results.

With regard to claim 12, the inlet angle in the range of 28° to 40° is substantially higher than in conventional rearwardly curved impellers. Angles in the low twenties are common whereas the optimum angle in Applicant's impeller is believed to fall in the neighborhood of 34°. Here again, this increase in blade inlet angle and the resulting

improvement in impeller performance is thought to derive from the laminar flow of air from the pin array with the inlet remote from the blades.

Other design characteristics set forth in the dependent claims cooperate with the aforesaid characteristics and are nowhere shown in the prior art individually or in combination.

In the light of the foregoing, it is believed that all claims are in condition for allowance, and such action is earnestly solicited.

Please refer to the remarks references had to the remarks filed in the response of 2/19/2003.

Respectfully submitted,

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